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**Wymagania dotyczące oceny hałasu  
w środowisku pracy**

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Tekst jest udostępniony do wykorzystania w ramach  
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## **REQUIREMENTS FOR EVALUATION OF NOISE IN WORK ENVIRONMENT**

### **Abstract**

The article analyzes the legislative requirements related to evaluation of noise generated by working environment. Specifies to the detail particular activities within categories of work for which there are declared legislative limits of the standardized sound level  $L_{AEX,sh}$ . It also briefly describes the work environment of the process welding from the perspective of noise exposure, whilst focus is on the determination of sound pressure values for the selected welding technology.

### **WYMAGANIA DOTYCZĄCE OCENY HAŁASU W ŚRODOWISKU PRACY**

#### **Streszczenie**

W artykule przeanalizowano wymagania prawne dotyczące oceny hałasu generowanego w środowisku pracy. Określono szczegóły działań odnoszących się do kategorii prac, dla których nie są deklarowane ograniczenia prawne, znormalizowanego poziomu dźwięku  $L_{AEX,sh}$ . Opisano również środowisko pracy w odniesieniu do procesu spawania z punktu widzenia narażenia na hałas, ze szczególnym uwzględnieniem wartości ciśnienia dźwięku dla wybranej technologii spawania.

### **Introduction**

From 1910 comes Kochov's statement that one day man will fight against noise so ruthlessly as against cholera and plague. Stormy development techniques agreed with him, because a person is exposed to increasingly higher levels of noise at work, at home, on the streets, but also in the wild. We can say that the noise is not a manifestation of technical progress, but rather decline it. The fundamental importance of this issue in the world today says that in developed countries is increasing annually recorded noise nuisance value in the work but also the environment [1, 5].

Often the measured sound pressure levels especially in the working environment significantly exceed the limit value, which is negligible in the long term negative impact on

human health. Due to excessive noise in terms of security often leads to many serious accidents at work and, therefore, it is necessary closely monitored physical factor.

### **Legislative aspects of the assessment of noise**

Noise as a negative factor for physical working environment is sufficiently underpinned by European legislation implemented in the Slovak law as well as the relevant prescriptive. For the measurement, evaluation and objectification of noise exposure in the work environment and the Slovak Republic were adopted at the national level, the following legislative and normative elements:

- Government Ordinance No.115/2006 on the minimum health and safety requirements for the protection of workers from risks related to exposure to noise.
- Act. 355/2007 on the protection, promotion and development of public health and amending certain laws.
- Ministry of Health no.549/2007 laying down details on the permissible values of noise, infrasound and vibration requirements and the objectification of noise, infrasound and vibration in the environment.
- STN EN ISO 80000-8, Quantities and units. Part 8: Acoustics.
- STN EN ISO 9612, Acoustics. Determination of noise exposure in the work environment. Engineering method.
- STN ISO 1996-1, Acoustics. Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures.
- STN ISO 1996-2, Acoustics. Description, measurement and assessment of environmental noise. Part 2: Determination of sound levels [3].

Those laws and norms define the variables determining the noise, the measurement methods provide action and limit values for the sound of life and working environment, which are important in assessing the negative effects of noise. Action and limit values are set for all departments as well as the welding department, where they can use the tools and the establishment of emitting excessive noise. In terms of the working environment are the legal requirements for each group works with set action levels for the implementation of the activity, which may not be exceeded. In Table 1. are given special values for the group work.

Table 1. Special values of normalized and sound latex, 8h for the group work [3]

Group work	Activity	Noise at work $L_{AEX,8h}$ (dB)
I	Activity requiring continuous concentration, or undisturbed communication: creative activities.	40
II	Activity in which communication is an important part of work performed: activity in which high demands on precision, speed, or attention.	50
III	Activity on a routine basis, in which the communication part of the work performed: the activity carried out on the basis of partial auditory information.	65
IV	Activity in which they are used noisy machines and tools, or which is performed in a noisy environment and which can not qualify as group works I, II or III.	80

For the evaluation of noise in the work environment is important measured values at the workplace include a suitable group of works by the task. On this basis, then compare the readings obtained with the action value Table 1. For better clarification Table 1. are different activities for these groups work, characterized in Table 2 [3].

Table 2. Examples of activities specified in detail for each group works [3]

Group work	Activity
I	Working in the office without noisy equipment Conversation with patients or visitors, the standard instruction (not on the premises and in the absence of other noise sources), meetings and negotiations.
II	Control or production management and remote control, hand assembly - completing, control, etc., Work associated with the accounting acts, or work on the computer, office applications, laboratory.
III	Sorting, packaging, labor availability, etc..., Service in restaurants other than dance clubs and discos.
IV	Mostly physical work, work using equipment and production processes on the premises and factories, agriculture and forestry, construction and heavy industry, cargo handling and transport equipment, work in dance restaurants and discotheques motorist.

Based on the foregoing, it can be included in the welding department working group IV. For this group is characterized by predominantly physical work, work using equipment and production processes on the premises and factories, agriculture and forestry, construction and heavy industry, cargo handling and transport equipment, where the values of normalized action levels A sound  $L_{AEX,8h}$  for 8h working shift set at 80 dB [3].

## Noise exposure to welding workplace

Noise during welding can reach values up to 110 dB, the noise source to the welding work is not only the welding, but exposure to high noise characteristic of the so-called. incidental, or ancillary works, such as joint preparation and final treatment of welds, as well as noise and exhaust ventilation equipment. High noise level is typified by the plasma, ultrasonic welding and explosion welding. The current increase in the volume of welding operations in large production plants causes ever increasing number of workers weight-bearing noise, it is therefore necessary to provide suitable acoustic conditions for individual workers [2, 5, 6].

Acoustic conditions for welding work depending on the local conditions, by:

- using the method of welding and welding noise machinery and equipment on the premises,
- size, weight, shape acoustic properties of weldments,
- demands on accuracy and quality of work, to a certain degree of acoustic comfort level for the type of work,
- the nature and duration of action of noise emission, time work in a noisy environment [2].

Control of acoustic conditions and limiting the adverse action of the noise in question is therefore affected or change these conditions. Priority should pay attention to the noise source, because their acoustic characteristics determine environmental noise workers [2].

Workplaces welders can be measured noise levels from 75 dB to 125 dB and more. The basic component if we disregard the impulse noise is irregular variable noise that lasts practically throughout the changes. According to the result of many measurements in large machinery sheds his values center around 90 dB. In Table 3. The values of sound pressure levels  $L_A$  noise for the selected workplaces welding [2].

Table 3. ranges of values of noise levels  $L_A$  fixed for those workplaces [4]

Process	Typical noise levels $L_A$
TIG	do 75 dB
MIG	92 – 102 dB
MMA	85 – 95 dB
Plasma cutting (hand-held up to 100A, cutting up to 25mm thickness only)	98 – 105 dB
Flame gouging	95 dB
Flame cutting	up to 100 dB (typically above 90 dB when cutting thicknesses above 40 mm)
Air arc gouging	100 – 115 dB
Mechanical treatment of welds	105 dB
Grinding	95 – 105 dB

In assessing the potential noise exposure of workers is an important aspect the duration of the operation, the value of which depends on the exposure for 8h working shift. In the assessment process it is necessary to take into account the individual worker exposure, which is influenced by the work of his colleagues in other neighboring workplaces [4].

## Options for reducing of exposure

Limiting of the noise environment should be based on the results of measurement and assessment of local acoustic conditions, sound pressure levels at workplaces welders, from an objective analysis and specification of the sources and causes of the noise.

The best option will be to eliminate the noisy process, perhaps by buying in the material cut to size by the supplier. However welding and hot cutting is often the only practical method so the main focus should be on practical methods to reduce noise levels for the given process and managing the residual risk using ear plugs, ear muffs or other hearing protection.

An example of this would be moving from hand-held plasma cutting to an automated submerged plasma cutter. This can result in noise levels below 80 dB(A). Water shrouded plasma cutters are available and may be practical for some operations. Submerged or water shrouded systems reduce fume emission as well as noise [4].

Within each welding technologies can contribute to minimizing noise in the following ways:

- 1) As a general rule, noise from arc welding increases with wire/rod diameter and operating current. Using a wire/rod size and current that are appropriate for the job ie not excessively large, should help to minimise noise levels.
- 2) With plasma/ flame cutting and arc gouging noise levels generally increase with increasing gas velocity. Ensuring that the gas velocity is as low as possible (eg reducing the outlet pressure at the regulator) will generally reduce the noise levels. Obviously there is a trade off between productivity rate and gas pressure however there will be a cross over where increased gas pressure does not significantly increase productivity.
- 3) Welding in confined spaces or other areas where sound may be reflected (such as the corner of a workshop) can give higher noise levels than if the welding is carried out in an open space. If it is not possible to organise the work to avoid these situations, the addition of sound absorbing materials to the reflective surfaces can be helpful in reducing the impact of the welding noise on others working nearby [4, 1].

In manner of Application of possibilities for reducing noise exposure of workers at individual workplaces it is important to consider not only very well in terms of safety and

health, but also in terms of economic efficiency. The proposed measures must be in accordance with the account maximum efficiency and performance of individual employees.

## Conclusion

Based on these findings the noise arising from the welding station still serious physical manifestation of this type of work environment. Noise exposure of individual workers is affected by the deployment, orientation, production at individual workplaces and the overall organization of work. Negative impact of noise is manifest not only in employees specific effects to the organ of hearing as auditory fatigue, or complete hearing loss, but it is necessary to take into account the non-specific effects of noise thus non hearable sound as infrasound and ultrasound, which can cause malfunctions of neurovegetative system and other more serious health damages.

Introducing measures to reduce exposure in this case is necessary. However, in the process of measuring and assessing noise exposure is necessary to consider all noise contributions and the values of equivalent sound pressure level  $L_{Aeq,T}$ , and on the basis of measured values to introduce such measures. The proposed measures may not provide any limitations in executing their work and certainly not of limitation of productivity of the operation.

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